

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) An electrotherapy apparatus comprising:

an electric energy storage section generating a stimulation pulse; ~~and~~

an output electrode for applying the stimulation pulse to a patient; and

output control means for reversing polarity of the voltage outputted to the output electrode, ~~and~~ outputting at least a first phase waveform and a second phase waveform to the output electrode, and controlling ~~the shape~~ an amplitude and a duration of the second phase waveform irrespective of a duration of the first phase waveform.

2. (Currently Amended) An electrotherapy apparatus comprising:

an electric energy storage section generating a stimulation pulse;

an output electrode for applying the stimulation pulse to a patient; and

output control means for reversing polarity of the voltage outputted to the output electrode, ~~and~~ outputting at least a first phase waveform and a second phase waveform to the output electrode, and controlling independently a duration of the second phase waveform and a predetermined an electric energy being delivered within a predetermined time period in the

~~second phase waveform~~ during the duration, within a range of energy remaining in the electric energy storage section.

3. (Previously Presented) An electrotherapy apparatus according to Claim 2, wherein the output control means controls the electric power of the electric energy outputted from the output electrode to become constant without depending on a value of the impedance of the patient during the output period of the second phase waveform.

4. (Previously Presented) An electrotherapy apparatus according to Claim 3, wherein the output control means controls the output so that the value relating to the voltage, which is lowered corresponding to the amount of the energy supplied from the electric energy storage section, changes corresponding to a function of the predetermined time period and the value relating to the voltage.

5. (Original) An electrotherapy apparatus according to Claim 4, wherein the value relating to the voltage is one of a voltage value, voltage differential value, and voltage double differential value.

6. (Previously Presented) An electrotherapy apparatus according to Claim 3, wherein the output control means controls the output so that the value relating to the current, which varies corresponding to the amount of the energy supplied from the electric energy storage

section, changes corresponding to a function of the predetermined time period and the value relating to the current.

7. (Original) An electrotherapy apparatus according to Claim 6, wherein the value relating to the current corresponds to one of a current value, current differential value, and current double differential value.

8. (Previously Presented) An electrotherapy apparatus according to Claim 2 further comprising:

patient parameter measuring means for measuring the patient parameter; and

output electrode parameter measuring means for measuring the voltage generated between the output electrodes, or the current flowing to the output electrode;

wherein the output control means controls the electric power of the electric energy to become constant without depending on a value of the patient impedance on the basis of the patient parameter measured by the patient parameter measuring means before the second phase waveform is outputted and a value, which relates to the voltage between the output electrodes or the current flowing to the output electrode, measured by the output electrode parameter measuring means during the output of the second phase waveform.

9. (Previously Presented) An electrotherapy apparatus according to Claim 2, wherein the output control means comprises:

an inductor;

an electric energy storage section;

first switch means for connecting the electric energy storage section,

wherein when the waveform of the electric energy outputted from the output electrode is the first phase waveform, an inductor, electric energy storage section, the first switch means, the output electrode, patient, and at least, another output electrode are connected to form a closed circuit,

wherein in the case where the waveform of the electric energy outputted from the output electrode is the second phase waveform, when the first switch means is closed, the inductor and the electric energy storage section without the patient form the closed circuit; and

wherein when the first switch means is opened, the inductor and the electric energy storage section are electrically separated, and the electric energy is delivered from the inductor to the output electrode.

10. (Original) An electrotherapy apparatus according to Claim 9, wherein the shape of the second phase waveform can be controlled by switching the first switch means.

11. (Previously Presented) An electrotherapy apparatus according to Claim 9, wherein the output control means further comprises second switch means and third switch means for shaping the first phase waveform and the second phase waveform of the electric energy outputted from the output electrode.

12. (Previously Presented) An electrotherapy apparatus according to Claim 11, wherein the first switch means, second switch means and third switch means comprise semiconductor switches.

13. (Withdrawn) An electrotherapy apparatus comprising:

an electric energy storage section generating a stimulation pulse;

an output electrode for applying the stimulation pulse to a patient; and

control means for controlling the shape of the waveform of the stimulation pulse such that the predetermined electric energy stored in the electric energy storage section is outputted to the output electrode through an electric circuit within a predetermined time period.

14. (Withdrawn) An electrotherapy apparatus according to Claim 13, wherein the control means controls the shape of the waveform of the stimulation pulse in such a manner that the electric power of the electric energy applied from the electrode becomes constant without depending on the value of the impedance of the patient.

15. (Withdrawn) An electrotherapy apparatus according to Claim 14, wherein the control means controls the output in such a manner that the value relating to the voltage which is lowered corresponding to the amount of the energy supplied from the electric energy storage

section changes corresponding to a function of the predetermined time period and the value relating to the voltage.

16. (Withdrawn) An electrotherapy apparatus according to Claim 15, wherein the value relating to the voltage is one of a voltage value, voltage differential value, and voltage double differential value.

17. (Withdrawn) An electrotherapy apparatus according to Claim 14, wherein the control means controls the output in such a manner that the value relating to the current which varies corresponding to the amount of the energy supplied from the electric energy storage section changes corresponding to a function of the predetermined time period and the value relating to the current.

18. (Withdrawn) An electrotherapy apparatus according to Claim 17, wherein the value relating to the current is one of a current value, current differential value, and current double differential value.

19. (Withdrawn) An electrotherapy apparatus according to Claim 13, further comprising:

patient parameter measuring means for measuring the patient parameter;

output electrode parameter measuring means for measuring the voltage generated between the output electrodes, or the current flowing to the output electrode; and

control means for controlling the apparatus such that the electric power of the electric energy becomes constant without depending on a value of the patient impedance on the basis of the patient parameter measured by the patient parameter measuring means before the second phase waveform is outputted and a value, which relates to the voltage between the output electrodes or the current flowing to the output electrode, measured by the output electrode parameter measuring means during the output of the second phase waveform.

20. (Withdrawn) An electrotherapy apparatus comprising:

an electric energy storage section generating a stimulation pulse;

an output electrode for applying the stimulation pulse to a patient; and

control means for controlling the shape of the waveform of the stimulation pulse in such a manner that the predetermined electric energy stored in the electric energy storage section is outputted to the output electrode through an electric circuit within a predetermined time period,

wherein the electric circuit has a switch to control the shape of the waveform of the stimulation pulse, and the control means makes the switch conduct the continuous switching operation by the pulse width modulation control during a period in which the stimulation pulse is applied to the patient.

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Patent Application No. 09/800,788

21. (Withdrawn) An electrotherapy apparatus according to Claim 20, wherein the control means has a reference curve to form the shape of the waveform of the stimulation pulse into the predetermined shape.

22. (Withdrawn) An electrotherapy apparatus according to Claim 21, wherein the control means controls the switching operation of the switch on the basis of the difference between the reference curve and the value relating to the voltage which is lowered corresponding to the amount of energy supplied from the energy storage section.

23. (Withdrawn) An electrotherapy apparatus according to Claim 21, wherein the control means controls the switching operation of the switch according to the difference between the reference curve and the value relating to the current which varies corresponding to the amount of energy supplied from the energy storage section.

24. (Withdrawn) An electrotherapy apparatus according to claim 20, wherein the control means controls so that the electric power of the electric energy applied from the output electrode becomes constant without depending on the value of the impedance of the patient.

25. (Withdrawn) An electrotherapy apparatus according to Claim 21, further comprising:

patient parameter measuring means for measuring the patient parameter; and

output electrode parameter measuring means for measuring the voltage generated between the output electrodes or the current flowing to the output electrode, and

wherein control means controls the switching operation of the switch on the basis of the patient parameter measured before the stimulation pulse is outputted by the patient parameter measuring means and a value, relating to the voltage between output electrodes or the current flowing to the output electrode, measured during the output of the stimulation pulse by the output electrode parameter measuring means.

26. (Withdrawn) An electrotherapy apparatus according to Claim 25, wherein the control means controls in such a manner that the electric power of the electric energy applied from the output electrode becomes constant.

27. (Withdrawn) An electrotherapy apparatus comprising:

an inductor section for storing magnetic energy to generate a stimulation pulse;

an output electrode for applying the stimulation pulse to a patient; and

control means for controlling the shape of the waveform of the stimulation pulse in such a manner that a predetermined energy in the energy stored in the inductor section is delivered to the patient through the output electrode .

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Patent Application No. 09/800,788

28. (Withdrawn) An electrotherapy apparatus according to Claim 27, wherein the apparatus has an electric energy storage section to store the energy in order to supply the energy to the inductor section.

29. (Withdrawn) An electrotherapy apparatus according to Claim 28, wherein the energy storage section is a capacitor, and when the energy stored in the inductor section is supplied to the output electrode, the control means can control in such a manner that the absolute value of the output is higher than the absolute value of the voltage stored in the capacitor.

30. (Withdrawn) An electrotherapy apparatus according to Claim 28, wherein the inductor section is connected to the electric energy storage section through first switch means which is repeatedly switchable, and the control means controls the repeated switching of the first switch means.

31. (Withdrawn) An electrotherapy apparatus according to Claim 30, wherein the control means controls the switching of the first switch means by a pulse width modulation control.

32. (Withdrawn) An electrotherapy apparatus according to Claim 27, wherein the control means controls the shape of the waveform of the stimulation pulse in such manner that

the electric power of the electric energy applied from the output electrode becomes constant without depending on the value of the impedance of the patient.

33. (Withdrawn) An electrotherapy apparatus according to Claim 27, wherein the control means has a reference curve in order to form the shape of waveform of the stimulation pulse into the predetermined shape.

34. (Withdrawn) An electrotherapy apparatus according to Claim 33, wherein the control means controls the switching operation of the switch according to the difference between the reference curve and the value relating to the voltage which is lowered corresponding to the amount of energy supplied from the energy storage section.

35. (Withdrawn) An electrotherapy apparatus according to Claim 33, wherein the control means controls the switching operation of the switch on the basis of the difference between the reference curve and the value relating to the current which varies corresponding to the amount of energy supplied from the energy storage section.

36. (Original) An electrotherapy apparatus according to Claim 2, further comprising:

a charging circuit for charging the energy storage section.

37. (Withdrawn) An electrotherapy apparatus comprising:

a positive polarity of an electric energy storage section (104) connected to an inductor (105) through first switch means (101), and from the opposite side terminal of the inductor (105), connected to the negative polarity of the electric energy storage section (104) through third switch means (103);

the opposite side terminal of the inductor (105) connected to an output electrode (112a) to apply an electric pulse on a patient (113) through an inductor (110); and an output electrode (112b) connected to the negative polarity of the electric energy storage section (104); and

a diode (108) and a diode (109) connected in series between the first switch means (101) and the inductor (110), in which the inductor (110) side is an anode, and the first switch means (101) side is a cathode; and

a capacitor (106) and a resistor (107) inserted between the diode (108) and the diode (109), and between the inductor (105) and a switch (102); and

a protective resistor (111) inserted between the output electrode (112a) and the output electrode (112b); and a charging circuit (115) to charge the electric energy storage section (104); and in which a diode (117) and a diode (118) are respectively inserted between both polarities of the energy storage section (104) and the charging circuit (115); a voltage monitoring circuit (114) connected across both polarities of the energy storage section (104); and a drive circuit (119) to control the open/close operation of the first switch means (101); a drive circuit (120) to control the open/close operation of second switch means (102); and a drive circuit (121) to control the open/close operation of the third switch means (103); and the drive circuit (119), the

drive circuit (120), the drive circuit (121) and the charging circuit (115) structured so that these can be controlled by a microprocessor (116).

38. (Withdrawn) An electrotherapy apparatus as claimed in claim 37, further comprising:

a current monitoring circuit (131) inserted between the positive polarity of the electric energy storage section (104) and the first switch means (101);

a resistor (132) inserted such that the resistor connects a portion between the current monitoring circuit (131) and the first switch means (101) to a portion between the inductor (105) and the second switch means (102); and

the microprocessor (116) at least has a ROM (141) in which the data of the reference curve is previously stored, and a digital/analog conversion circuit (140) to convert the data of the ROM (141) into the analog data;

a gain switching circuit (133), and a pulse width modulation circuit (143) housing therein at least an error amplifier (142);

a pulse width modulation circuit (143) connected such that a voltage signal (138) from the digital/analog conversion circuit (140) and a voltage signal (137) from a gain switching circuit (133) are inputted thereto; and

the gain switching circuit (133) connected such that a control signal (136) from the microprocessor (116), a signal (135) from the current monitoring circuit (131), and a signal (134) from the voltage monitoring circuit (114) are inputted thereto.

39. (Previously Presented) An electrotherapy apparatus according to Claim 2, wherein the apparatus is an external type defibrillator which applies the stimulation pulse onto the body surface of the patient.

40. (Previously Presented) An electric energy delivering method of an electrotherapy apparatus comprising an electric energy storage section and switching means connected to an output of the electric energy storage section, wherein electric energy stored in the electric energy storage section is delivered via the switching means to a patient in biphasic waveform, the method comprising:

delivering a necessary electric energy in a first phase waveform;

delivering the necessary electric energy within a predetermined time period from the remaining energy in a second phase waveform, wherein a shape of the second phase waveform is arbitrarily controlled within a range of energy remaining in the electric energy storage section.

41. (Canceled).

42. (Previously Presented) An electric energy delivering method of an electrotherapy apparatus comprising an electric energy storage section and switching means connected to an output of the electric energy storage section, wherein electric energy stored in the electric energy storage section is delivered via the switching means to a patient, the method comprising:

delivering a necessary electric energy in a first phase waveform; and

delivering a necessary electric energy from the electric energy remaining in the electric storage section in a second phase waveform and the first phase waveform which are alternately repeated at least once,

wherein a shape of the first phase waveform and a shape of the second phase waveform are arbitrarily controlled at the step of delivering the necessary electric energy from the electric energy remaining in the electric storage section.